



**NORTHCENTRAL UNIVERSITY
ASSIGNMENT COVER SHEET**

Student: **Michael Higley-Vance**

THIS FORM MUST BE COMPLETELY FILLED IN

Follow these procedures: If requested by your instructor, please include an assignment cover sheet. This will become the first page of your assignment. In addition, your assignment header should include your last name, first initial, course code, dash, and assignment number. This should be left justified, with the page number right justified. For example:

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Save a copy of your assignments: You may need to re-submit an assignment at your instructor's request. Make sure you save your files in accessible location.

Academic integrity: All work submitted in each course must be your own original work. This includes all assignments, exams, term papers, and other projects required by your instructor. Knowingly submitting another person's work as your own, without properly citing the source of the work, is considered plagiarism. This will result in an unsatisfactory grade for the work submitted or for the entire course. It may also result in academic dismissal from the University.

EDU7006-8

Dr. Rebecca Watts

Quantitative Research Design

**Activity #7b: Explore Samples, Power
Analysis, and Design Sensitivity**

Comments:

Faculty Use Only

<Faculty comments here>Michael, I made some comments in your paper. I have some suggestions for your considerations. The correlation design is not the correct design for your study. It is likely that you will not be able to randomly select the participants for your study. Thus, the quasi-experimental design is probably the best choice for you. Now, I would probably give the group of students a pre-test on the motivational survey (at the beginning of school). I would randomly choose a control group from the remaining middle school students (same grade level and as much sameness as possible). Then, I would

give this group a motivational survey at the beginning of the school year. I would obtain the number of discipline infractions committed by both groups of students for the previous term (semester or year) and obtain this measure again for the same amount of time during their instruction with belended methods. You could also obtain a pre and post measure of achievement such as the previous year's achievement scores and the scores at the end of the year during which blended instruction is provided. You might could use growth scores (growth during the previous year and grown during the year in which blended instruction was provided). Thus, you have 3 dependent variables and you have a pre and post measure for all 3. You have 3 groups, one is the control and one is the treatment. You will need to defend your small sample. I am sending you to a website that will help you understand how the different factors influence power.

<http://www.socialresearchmethods.net/kb/power.php>

<Faculty Name>

<Grade Earned>

<Writing Score>

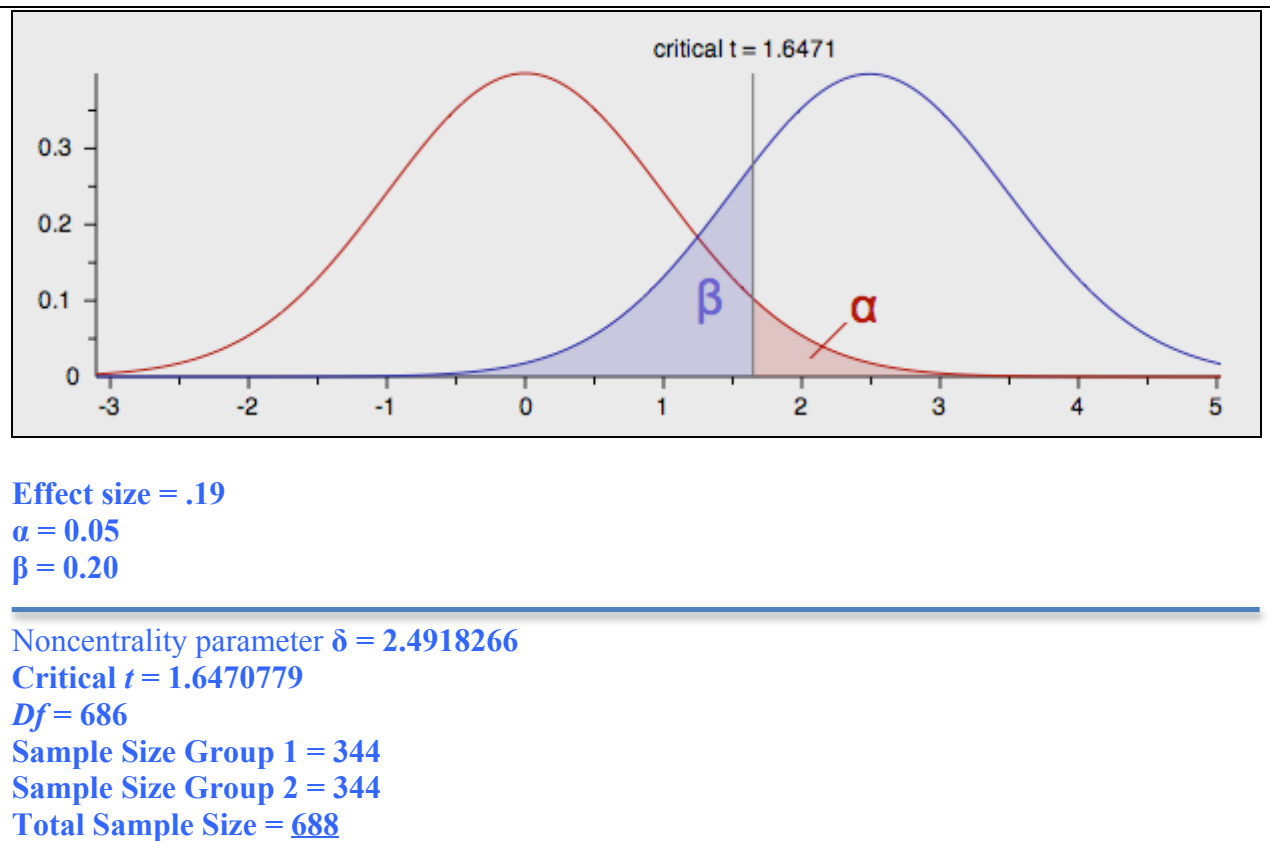
<Date Graded>

Activity 2: Explore Samples, Power Analysis, and Design Sensitivity

1. Calculate the sample size needed given these factors:
 1. one-tailed t-test with two independent groups of equal size
 2. small effect size (see Piasta, S.B., & Justice, L.M., 2010) .19
 3. $\alpha = .05$
 4. $\beta = .2$

#1 Answer

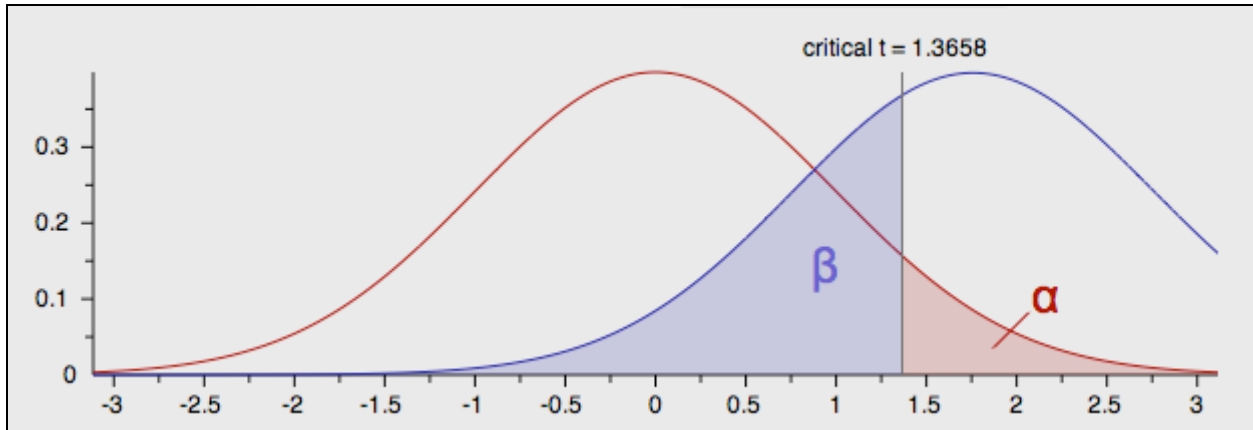
One-tailed t-test with two independent groups of equal size:



2. Assume that the result is a sample size beyond what you can obtain. Use the compromise function to compute alpha and beta for a sample half the size. Indicate the resulting alpha and beta.

#2 Answer

One-tailed t-test with two independent groups of equal size with Compromise power analysis:



Noncentrality parameter $\delta = 1.7619875$

Critical $t = 1.3657843$

$Df = 342$

α error of prob = 0.0864521

β error prop = 0.3458084

Power ($1 - \beta$) = 0.06541916

Sample Size Group 1 = 172

Sample Size Group 2 = 172

Total Sample Size = 344

Present an argument that your study is worth doing with the smaller sample: The most appropriate sample size for this study will be determined by using the Evaluating Sampling method (Fritz & Morgan, 2010): previous research conducted to determine similar behavioral outcomes, historical data, and “rules of thumb”. In order for researchers to select a sample size that will effectively draw conclusions about the effects of a treatment they must make decisions based on one or more factors: prior research, historical data, pilot studies, and/or “rules of thumb” (Houser, 2007, p. 1; McCready, 2006). Researchers must consider using a large sample size to detect a statistically significant outcome with the cost and duration of collecting data from such a large sample size (Houser, 2007). Additionally, although a larger sample size may

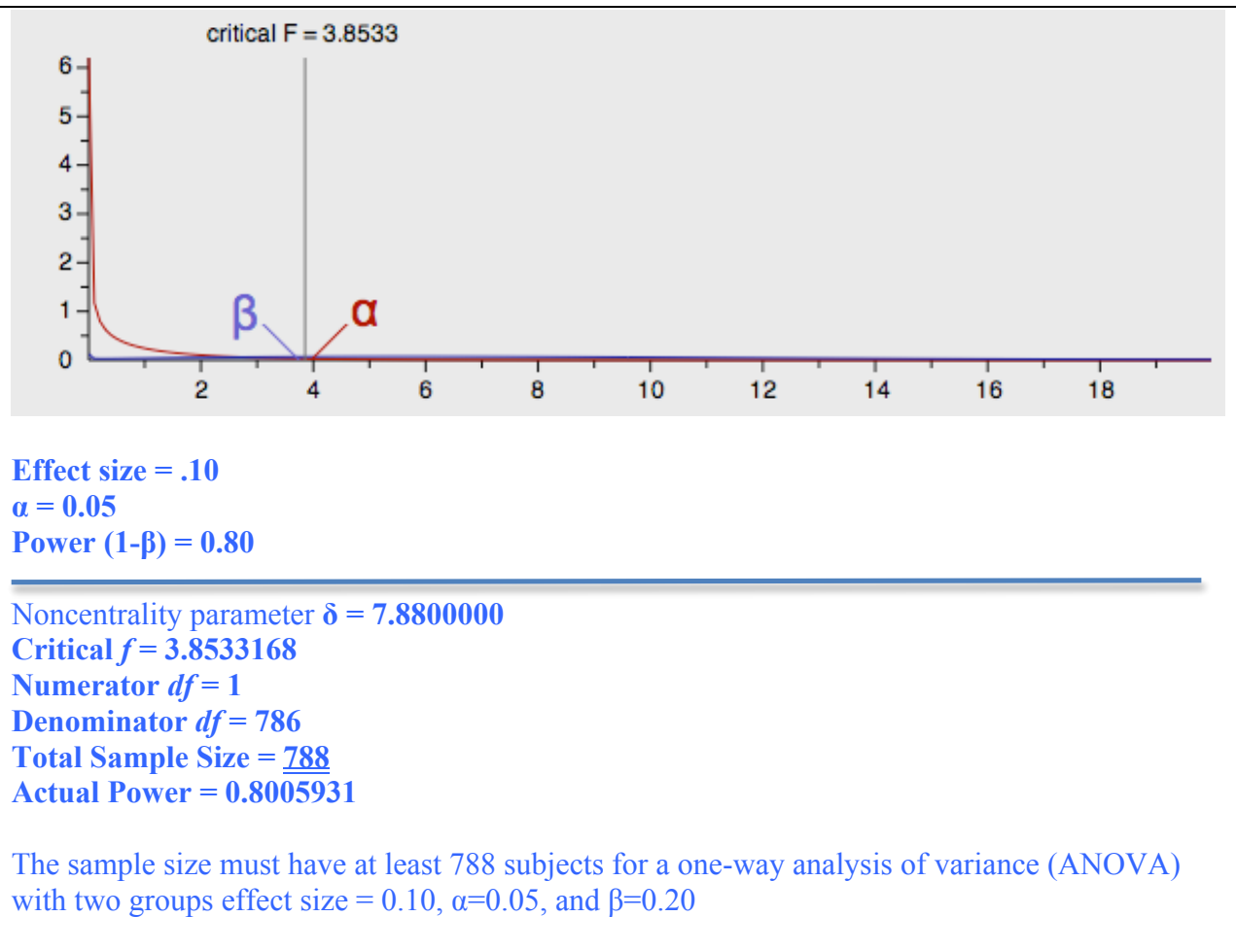
increase the chances of getting a significant outcome (Houser, 2007) it can also increase the chances of the researcher making a Type I error (Mayr, Erdfelder, Buchener, & Faul, 2007; Trochim & Donnelly, 2008). A smaller sample size may reduce the chances of drawing a significant outcome however, this does not mean an outcome cannot be determined (Houser, 2007). According to Mayr, Erdfelder, Buchener, & Faul (2007) and Houser (2007) different types of power analysis are determined by the statistical test it requires due to the sensitivity of each test. Changing the sample size compromises the power analysis, which increases the chances of the researcher making a Type II error (Houser, 2007). However, given a one-tailed t-test with two independent groups of equal size with a compromise power analysis, a smaller sample size might be more effective at drawing a significant conclusion of the treatment while considering possible Type I and Type II errors. Good discussion here Michael. When you develop your proposal for your dissertation, you will likely need to use a smaller sample than that which is recommended by G*Power. You will either increase alpha or decrease power or both when reducing the sample size. You will want to defend your reduced sample based on how the reduced sample size will influence alpha and beta and power. And, your defense will need to be more specific with regard to the context of your study.

3. Calculate the sample size needed given these factors:

1. ANOVA (fixed effects, omnibus, one-way)
2. small effect size .10
3. alpha = .05
4. beta = .2
5. 3 (4) groups

#3 Answer

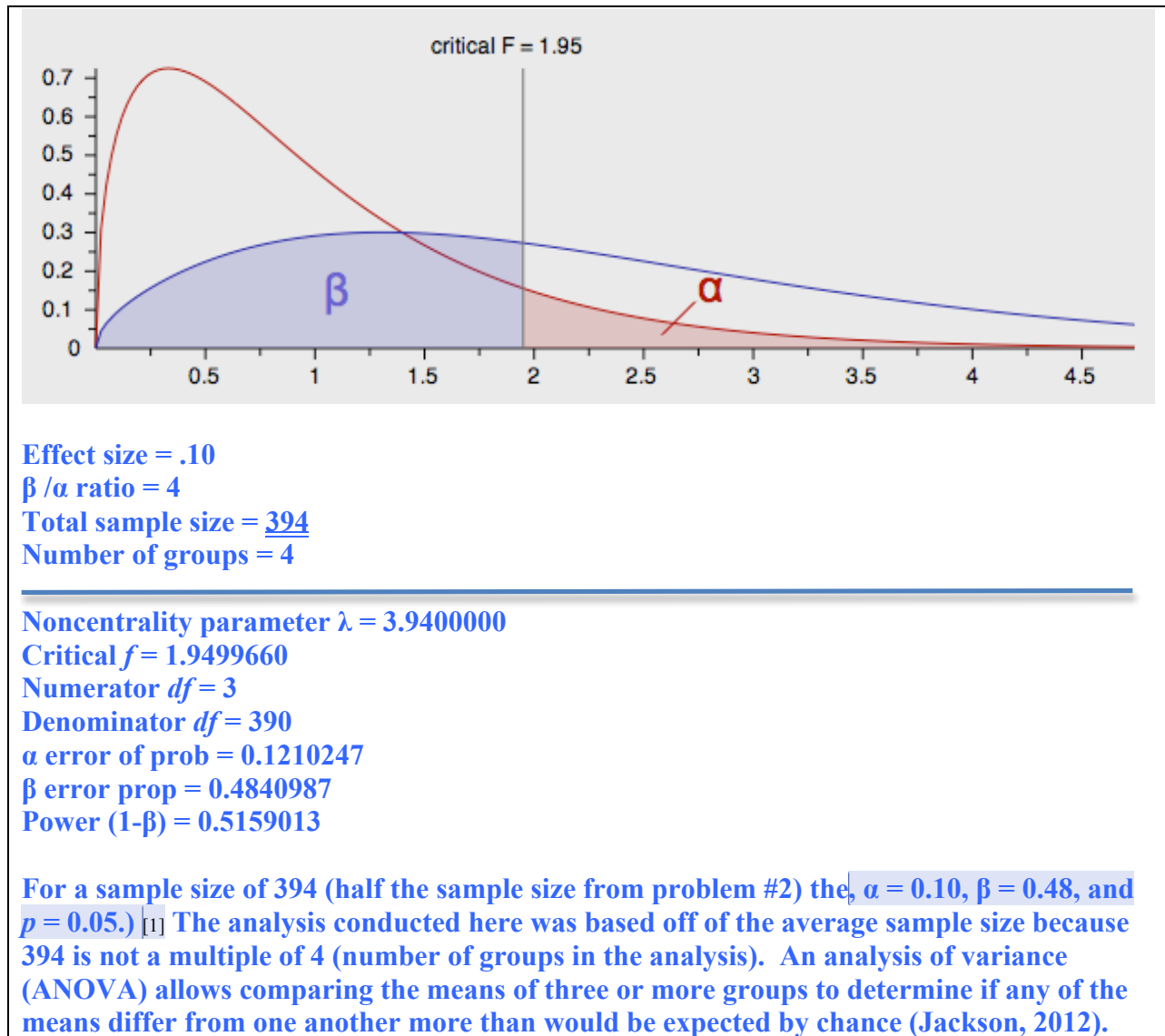
ANOVA Fixed effects, omnibus, one-way with A Priori power analysis:



4. Assume that the result is a sample size beyond what you can obtain. Use the compromise function to compute alpha and beta for a sample approximately half the size. Give your rationale for your selected beta/alpha ratio. Indicate the resulting alpha and beta. Give an argument that your study is worth doing with the smaller sample.

#4 Answer

ANOVA Fixed effects, omnibus, one-way with compromise power analysis:



5. In a few sentences, describe two designs that can address your research question. The designs must involve two different statistical analyses. For each design, specify and justify each of the four factors and calculate the estimated sample size you'll need. Give reasons for any parameters you need to specify for G*Power.

Research Questions

Q1. Do inappropriate behaviors of middle school students, as measured by student discipline records (SDR), decrease when students participate in a blended learning approach to classroom instruction?

Q2. Does motivation of middle school students, as measured by an anonymous student survey and student academic records, increase when students participate in a blended learning approach to classroom instruction?

Research Hypotheses

Collecting student behavior information, using an anonymous online survey, and taking into consideration student academic assessment outcomes the hypotheses will be tested. Each question addresses a null hypothesis with no expectation of a significant relationship (Leedy & Ormrod, 2010) and an alternate hypothesis that proposes that a significant correlation does exist between the independent variable – a blended approach to teaching and learning, and the dependent variables – of student satisfaction, motivation, and inappropriate social behaviors.

H1₀. A measure of inappropriate student behaviors is statistically equivalent and unchanged when teaching and learning is driven primarily by technology enriched learning applications and resources.

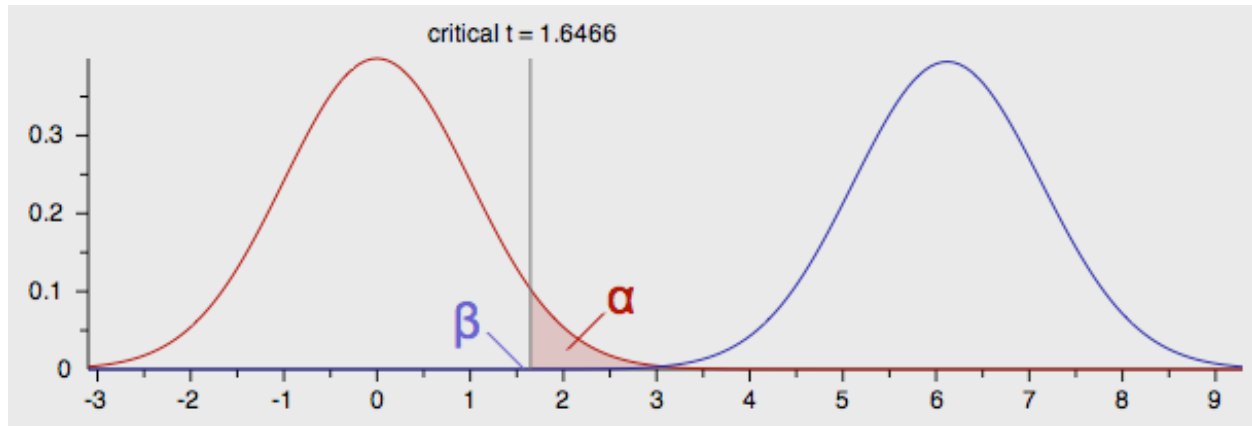
H1_a. A measure of inappropriate student behaviors is statistically different and decreases when teaching and learning is driven primarily by technology enriched learning applications and resources.

H2₀. A measure of student motivation is statistically equivalent and unchanged when teaching and learning is driven primarily by technology enriched learning applications and resources.

H2_a. A measure of student motivation is statistically different and positively affected when teaching and learning is driven primarily by technology enriched learning applications and resources.

Power Analysis #1

Design #1 uses a correlational statistical test and post hoc power analysis. This approach is most closely related to the data available through the selected school system and aligned with the research questions. The achieved power analysis will be based on given variables of α , sample size, and effect size.

#5 Answer**Power Analysis One: t-Test, Correlational, Post hoc, and one tail**

Effect size = .2

α error of prob = .05

Total sample size = 900

Noncentrality parameter $\delta = 6.1237244$

Critical $t = 1.6465522$ _[2]

Df = 898

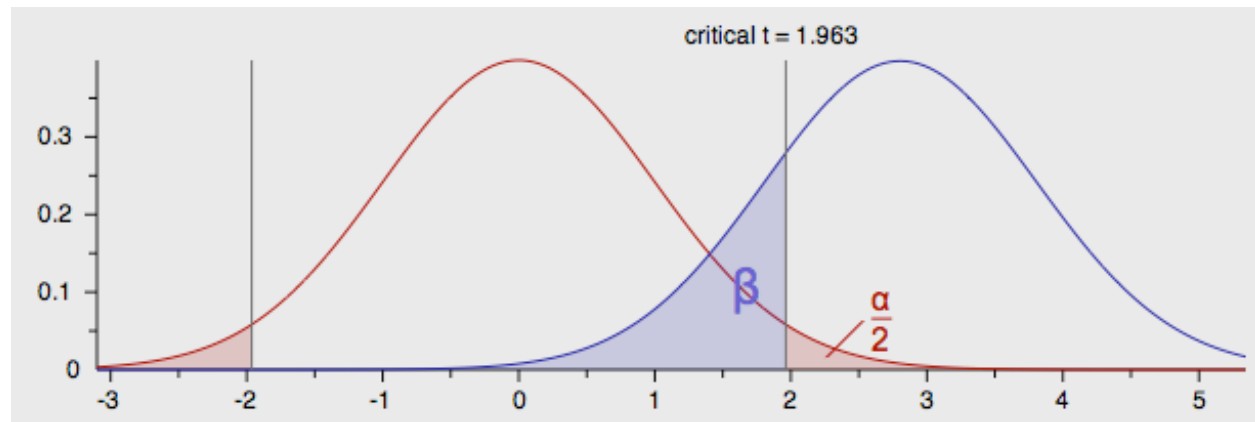
Power (1- β) = 1.0000000

Power Analysis #2

Design #2 is based on a priori analysis using values of $\alpha=0.05$ and $\beta = 0.2$ which, requires a minimum sample size of $N = 394$. According to Piasta and Justice (2010) values of $\alpha=0.05$ and $\beta = 0.2$ are generally acceptable for most research in the social sciences. Based on the preceding factors, the minimum sample size is required to have an optimal chance of rejecting the null hypothesis of middle school student data to have the best chance of rejecting the null hypothesis (Faul, Erdfelder, Lang, & Buchneer, 2007).

#5 Answer

Power Analysis Two: t-Test, Difference, A priori, and two tail



Effect size = .2

 α error of prob = .05Power (1- β) = .8

Allocation ratio N2/N1 = 1

Noncentrality parameter δ = 2.8071338Critical t = 1.9629867

Df = 786

Sample Size Group 1 = 394

Sample Size Group 2 = 394

Total Sample Size = 788

Actual Power = 0.8005931

Purpose of the Proposed Research

The purpose of this quantitative correlational [3] study is to investigate whether or not a blended learning environment has an affect on student satisfaction and motivation. Additionally, this study will investigate whether there is a decrease in middle school problem behaviors as a result of participating in a blended learning environment where teaching and learning is driven by primarily technology enriched learning applications and resources. The study will be located in middle Tennessee, specifically targeting one area middle school. An experimental group of approximately 30 students will be selected prior to the start of school [4]. Three separate data pieces will be collected throughout the study, which include: (a) student discipline records (SDR)

reporting on student problem behaviors, (b) anonymous online student surveys, and (c) student achievement scores. This protocol will be used to gather information about student behaviors, motivation, satisfaction, and academic progression for study evaluation.

References

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